Observations made at Paramatta during the Eclipse of the Sun on Saturday, February 1, 1851. By the Rev. W. B. Clarke.

The account given by Mr. Clarke of the observations, of which an abstract is here given, was originally published in the *Sydney Morning Herald*, and has been since forwarded by that gentleman to the Society. The observations were made at Newlands, Paramatta, by Mr. Clarke, in conjunction with Captain P. King. As it is certain that the eclipse was annular at some place near Sydney, and as some doubts are entertained whether certain interesting phenomena that were seen at the time of greatest obscuration were due to the completion of the annulus, or to the near approach to it, Mr. Clarke has appended a plan of the localities in the neighbourhood of the place of observations, from which it appears that his station was the most northerly of all at which observations were taken, but that it probably lay without, though very near to, the northerly limit for the annular eclipse. On the whole, he considers that the annulus was not complete at his station.

The observations made by Mr. Clarke were chiefly meteorological, though he occasionally viewed the progress of the eclipse both through the telescope used by Captain King, which was provided with a red shade, and through another provided with a green shade.

For the meteorological observations Mr. Clarke had Captain King's standard barometer, and an aneroid of his own, which was first compared with it. He had also two thermometers with blackened bulbs, from one of which he had removed the scale by means of a hinge, so as to have the bulb and part of the tube perfectly free; and this he had compared with a standard before commencing. The other had a brass scale unremoved, and both were so placed in a shallow box as to receive the full effect of the sun's rays. Besides these, he was furnished with a wet and a dry bulb thermometer, and with a Daniell's hygrometer.

The meteorological observations we shall classify under the heads, pressure of the air, temperature, radiation, and humidity. The other observations relate to obscurity, effect on vegetation, and the direct phenomena of the eclipse.

Pressure of the Air.—No barometrical results are indicated which show any effect of the eclipse. The small changes in height during its progress are in accordance with the ordinary laws.

Temperature.—The depression of temperature due to the eclipse was found to be $2^\circ{\cdot}82$ at $5^h\ 24^m$ (the depression for the time of day being allowed for), and this depression continued for about 32 minutes.

Radiation.—The effect on this element was very remarkable. The indications of the brass scale thermometer varied from 111° to 71°, or gave a difference of 40°. The indications of the thermometer with the bare bulb varied from 92° to 68°, giving a difference of 24°. Sudden and frequent variations occurred, which Mr.

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Clarke attributes to insensible vapours in the atmosphere. At the time of greatest obscuration the radiation thermometers stood at about the same height as the dry thermometer.

Humidity.—The dew-point, as calculated by the indications of the dry and wet bulb thermometer, varied from 64°·1 to 61°·6, the corresponding dry temperatures varying from 73° to 69°·5. The greatest humidity occurred about the time of the middle of the eclipse.

Obscurity.—Mr. Clarke fancied that the cattle seemed affected by the diminution of light, and he was informed that fowls in some places were preparing for roost. The appearance was that of early morning; but the general hue to the naked eye, at the greatest observation, was that of a pale, sickly green.

Effect on Vegetation.—Immediately beneath the verandah whereon the observation was made grew a plant called the "Four o'clock flower," from the time of the usual opening of its blossoms. Three petals began to unfold, but during the greatest obscuration they closed again; nor did they fairly unfold till the eclipse was nearly over.

Direct Phenomena of the Eclipse.—By Captain King's observations, the eclipse commenced at $4^h\ 6^m\ 6^s$, local time, and terminated at $6^h\ 31^m\ 35^s$. He observed with a refracting telescope of 44 inches focal length, and of 2¼ inches aperture, mounted equatoreally, using a power of about 40. He made, during the eclipse, several drawings of the solar spots, and of the different phases of the obscuration.

Mr. Clarke describes the moon as looking spherical and dark, "like a huge cannon-ball, that, having been corroded, is painted black. Its limb was generally far more distinct than that of the sun. A kind of mirage played along the inner edge of the sun's limb, and on the outer edge of the moon, accompanied by undulations. The cusps of the sun were generally most beautifully and delicately defined; but, towards their nearest approach, the points were blunted at one time, and protusions of black interspaces, like slopes of a mountain, divided the light at the angle."

From the near approach to an annular eclipse which took place at his station, Mr. Clarke was prepared to expect something like the phenomenon of "*Baily's beads*;" and when the cusps approached nearest to each other, he was anxiously watching at the telescope. He saw distinctly a formation of the "beads," with "dark bands" between, uniting the edges of the sun and moon near the points of the cusps, just as they are described by Mr. Baily; and he then saw flashes of *white* light rush across the dark portion of the moon from each cusp, but he did not see them unite, though they approached very close to each other.

Captain King saw the junction very nearly all round. Mr. Clarke did not see it all round; but the threads of light were very near to each other; and his impression was that it was not the sun's body, but light glancing rapidly from one summit of the moon to another, "either refractions from the sun, or reflected earth-light: but the

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lights certainly came from the direction of either cusp, and nearly touched. This phenomenon lasted but a very few seconds."

Some gentlemen, who threw the image of the sun upon a screen through their telescopes and theodolite-glasses, say they saw the line well defined all round upon the paper. The light, on the contrary, which Mr. Clarke saw, was in rapid projection, quickly disappeared, and was quite *white;* whilst the sun's light in the telescope was that of the *green* screen.

Mr. Clarke's observations of the eclipse have convinced him that, if the moon have any atmosphere, it is of extreme rarity; but, by observations of the eclipses of several spots, he is induced to think that there is *some* atmosphere, however rare.

An Account of placing Meridian Marks for the Stonyhurst Transit Circle. By the Rev. A. Weld, F.R.A.S.

"As the observatory of Stonyhurst possesses the advantage of a well-defined and unobstructed horizon, both in the northern and southern direction, it had long been my wish to fix marks exactly on the north and south points, with which I might compare the position of the transit circle, and so be aware, at sight, of any change that might take place in the bearings of the instrument. I believe the existence of a good meridian mark is always looked upon as an advantageous circumstance in the equipment of an observatory; and since on our horizon there was no object sufficiently defined, and near enough to the meridian, to answer that purpose well, I thought it worth while, to remedy that defect, to determine the exact north and south points of the meridian passing through our transit circle, and to fix marks there which should be easily seen with the ordinary observing power of the telescope.

"I must first state that the north and south points in our horizon are between four and five miles distant from the observatory, the northern being about 500, and the southern 300 feet above our level.

"The first object to be gained was to find the south point approximately, so as to confine our operations within the field of the telescope. This was effected in the following manner:—Two high poles were erected approximately in the meridian line; on the top of one an English, and on the other a French flag was hoisted. The object of these was to guide the exploring party into the right direction: this was known by the flags appearing in the same line. An observer accustomed to the use of telescopes was stationed in the observatory, with an assistant at each flag-post to work the signals, and two others to convey the requisite messages; whilst I went myself, with two or three others, to the hills, provided with a hand-telescope, a small flag, and a staff about eight feet long.

"It was arranged, before starting, that both flags should fly until we appeared on the horizon within the field of the telescope of the transit circle.

"The falling of one of the flags was the signal that we had been thus seen, and were therefore within a short distance of the